

REMARKS

Applicants acknowledge with appreciation the indication of allowable subject matter in that claims 5, 16, 20, 21, 27, 34-37 and 39 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. For the present time Applicants have not rewritten these claims in independent form since it is believed that the base claims are also allowable over the prior art of record.

However, Applicants have amended claims 2, 6, 14, 15, 17, 18 and 33 to overcome the rejection under 35 USC 112. New claims 40 and 41 have been added to the application to canceled subject matter from claims 2 and 17 and are thus fully supported by Applicants specification. Applicants most respectfully submit that all the claims now present in the application are in full compliance with 35 U.S.C. §112 and are clearly patentable over the references of record.

The rejection of claims 2, 6, 14, 15, 17, 18 and 33 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention has been carefully considered but is most respectfully traversed in view of the amendments to the claims. Applicants were unable to find the phrase "such as" in claim 6. However, Applicants amended claim 6 to be in proper Markush language. Claims 2, 14, 15, 17, 18 and 33 have been amended to eliminate the terms which are alleged to render the claims indefinite. In view of the amendments to the claims, it is most respectfully requested that this rejection be withdrawn.

The rejection of claims 1, 3, 4, 7-12, 23, 24 and 29 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent 4,562,158 to Schellenberg has been carefully considered but is most respectfully traversed in view of the following comments.

Applicants wish to direct the Examiner's attention to MPEP § 2131 which states that to anticipate a claim, the reference must teach every element of the claim.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is

contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed Cir. 1989). The elements must be arranged as required by the claim, but this is not an *ipsissimis verbis* test, i.e., identity of terminology is not required. *In re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed.Cir. 1990).

Akzo N.V. v. International Trade Comm'n, 808 F.2d 1471, 1 USPQ2d 1241 (Fed. Cir. 1986) (Claims to a process for making aramid fibers using a 98% solution of sulfuric acid were not anticipated by a reference which disclosed using sulfuric acid solution but which did not disclose using a 98% concentrated sulfuric acid solution.).

According to the Official Action, the Schellenberg reference teaches a solid phase scintillation element comprising a solid scintillation material that is added to a carrier material. The carrier includes cellulosic fibres and silica gel which are hygroscopic materials.

However, Applicants most respectfully submit that one of ordinary skill in the art would not agree with this statement because the scintillation counter and the method used are entirely different from that which is disclosed in the present application. The Schellenberg reference is designed to replace the traditional method of liquid scintillation counting whereby ^{14}C or ^3H are absorbed on strips of paper or a similar carrier. In the traditional method, the disposable sampler is soaked in liquid scintillation solution. The liquid scintillation solution is next put into a liquid scintillation spectrometer to measure how much radioactive substance has eluted from the carrier. Schellenberg modifies this process by applying scintillation chemicals to the carrier, before or after it is soaked in the radioactive substance, and subsequently places the modified carrier into a liquid scintillation spectrometer.

The presently claimed invention, however, defines a hygroscopic scintillator element as a permanent part of a continuous real time monitor of watery tritium species in a gas, such as a real-time discriminating monitor for tritiated water vapour in air. There are fundamental differences between the contents disclosed in Schellenberg and that of the present invention. In particular, Schellenberg's carrier absorbs the radioactive substance irreversibly. However, the hygroscopic scintillator element of the

present invention exchanges water reversibly and continuously with a gas as it flows past. The radioactivity in Schellenberg's carrier is measured once off in a separate subsequent step to soaking up the radioactive substance whereas the hygroscopic scintillator of the present invention measures the activity of tritiated water in a gas continuously and whilst it is in contact with the gas because of continuous reversible exchange of water between the watery hygroscopic layer and the gas. Therefore, Schellenberg's carrier is merely a one-off disposable strip impregnated with the radioactive substance. In complete contrast, the hygroscopic scintillator of the present invention is a permanent monitor which can be reused. Schellenberg's carrier is made by applying finely dispersed scintillating chemicals to an absorbent solid carrier, typically paper. In contrast the scintillating element of the present invention is a bulk solid of YAP or scintillating plastic sheet which has layered thereon the hygroscopic layer which is typically applied with a controlled thickness and is generally a liquid or gel. The device of the Schellenberg reference intimately mixes a scintillating chemical with the absorbent carrier in contrast to the hygroscopic scintillator element of the present invention which includes the hygroscopic layer, on the surface of the scintillator. The element of the present invention provides significant degrees of efficiency as compared to that of Schellenberg which shows poor tritium counting efficiency between 0 and 7.3%. Therefore, in contrast to the allegation in the Official Action, the device of Schellenberg in no way anticipates, does not meet the claimed limitations of the device of the present invention. Accordingly, it is most respectfully requested that this rejection be withdrawn.

The rejection of claims 1, 2, 11, 13-15, 17-19, 22, 23, 25, 26, 28, 30-33 and 38 under 35 U.S.C. 103(a) as being unpatentable over Schellenberg '158 in view of Great Britain publication 1,092,797 to Atomic Energy of Canada Ltd. has been carefully considered but is most respectfully traversed.

Applicants wish to direct the Examiner's attention to the basic requirements of a prima facie case of obviousness as set forth in the MPEP § 2143. This section states that to establish a prima facie case of obviousness, three basic criteria first must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to

modify the reference or to combine the reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Section 2143.03 states that all claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

The teachings of the Schellenberg reference discussed above are equally applicable to the present rejection as distinguishing features of the claimed invention. The combined disclosure of Schellenberg and the Atomic Energy paper do not render the claimed invention *prim facie* obvious. The Atomic Energy paper teaches a particular geometry of scintillation detector. There is no mention anywhere in this document of using a hygroscopic layer to enhance the performance of the monitor. This is in spite of a strong commercial interest in making a discriminating monitor which could be sensitive enough to detect the safety limit for exposure of workers to tritiated water vapour. There is a very good reason for this as the idea of layering the hygroscopic layer on the scintillator would never have been considered by the skilled practitioner. That is, there is no motivation to make the necessary combination absent Applicants' teaching which may not be used as a basis to combine the references. *In re Fritch*, 23 USPQ 1780, 1784 (Fed. Cir. 1992) ("It is impermissible to engage in hindsight reconstruction of the claimed invention, using the applicant's structure as a template and selecting elements from references to fill the gaps.).

While it may well have been considered by one of ordinary skill in the art at one time that applying a hygroscopic layer to the surface of a solid scintillator might well make it more sensitive for tritiated water vapour there would never have been motivation to do this because of various technical prejudices that prevailed at that time.

In particular, it was the view at the time that the monitor would be too sensitive to humidity levels to operate effectively. As mentioned in Applicants' specification, the concentration of tritium per gram of water is inversely proportional to the humidity of the gas which tends to decrease the sensitivity of the monitor as the humidity increases. The monitor of the present invention shows a response practically independent of the humidity of air. This was shown using a hygroscopic layer of zinc chloride about 0.4 microns thick at 60% relative humidity. The explanation for the relative independence of the function of the monitor to the humidity and air is complex. It is due to the particular non-linearity in the relation of film thickness towards partial pressure in this hygroscopic film which cancels the non-linearity in the dependence of sensitivity on film thickness due to self-absorption. Therefore, the effect of humidity levels tends to be negated. This is a surprising indication which would not have been apparent to the skilled practitioner and which renders the present monitor almost independent of humidity levels which was not appreciated in the art. The teaching of the art as it would be interpreted by the skilled artisan, at the time of the invention must be taken into consideration.

Furthermore, the skilled practitioner would have been particularly sceptical that the sensitivity of the detector could reach better than the derived air concentration for HTO in air which lies several orders of magnitude below the sensitivity limit for the detector described in Atomic Energy '797. Until now, scintillating detectors have only ever been used for high levels of tritium inside a sealed plant. However, the monitor of the present advantageously increases HTO sensitivity by 3 to 4 orders of magnitude with a sensitivity limit well below the DAC safety limit for tritiated water vapour in air.

Furthermore, the skilled practitioner would not have contemplated using the hygroscopic layer in the manner described for the present invention because it would not be apparent to the skilled practitioner that the detector would have a sufficiently low tritium memory to be of practical use so as to avoid irreversible tritium contamination. The monitor of the present invention shows much lower tritium memory than any previous tritium monitor. This is because almost all of the absorbed water easily and reversibly exchanges as tritium moisture in the gas is replaced by ordinary moisture, whereas in conventional monitors most residual tritium is strongly bound at adsorption

sites or dissolved in the surface of the materials thus taking much longer to merge and this is the case with the monitor disclosed in Schellenberg. Furthermore, by virtue of the very quick exchange of water molecules the hygroscopic layer and the passing gas, the response time for the monitor is extremely quick.

The hygroscopic element of the present invention is particularly advantageous because it mimics the absorption of tritiated water vapour in the human lung and therefore introduces the concept of a total tritium toxicity metre for all tritiated species breathed by workers. Accordingly, it is most respectfully requested that this rejection be withdrawn.

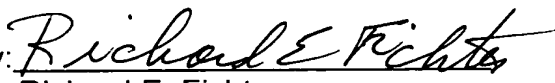
The specification has been amended as requested in the Official Action. However, Applicants submit that this amendment is unnecessary since PCT application is not a prior application. Applicants also most respectfully request that an initialled and dated copy of the form 1149 submitted with the preliminary amendment necessary to make of record the references cited in the International Search report be returned with the next Official Action. These references include those relied upon in the prior art rejections and which have not been listed on the form PTO-892 included as part of the outstanding Official Action.

It is also requested that the next Official Action acknowledge acceptance of the drawings filed with the application.

In view of the above comments and further amendments to the specification and claims, favorable reconsideration and allowance of all of the claims now present in the application are most respectfully requested.

Respectfully submitted,

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Marked-Up Version of Changes Made

IN THE SPECIFICATION:

Please add the following as the first paragraph.

This application is a 371 of PCT/EP98/06047, filed September 22, 1998.

IN THE CLAIMS:

Please replace claim 2 with the following amended claim.

2(Amended). A scintillator element according to claim 1 wherein said solid scintillator material comprises any of, a plastic, an inorganic ["phosphor" (such as doped zinc sulphide)] phosphor, an oxide based material, a glass or a combination of these materials.

Please replace claim 6 with the following amended claim.

6(Twice Amended). A scintillator element according to claim 1 wherein said hygroscopic material is selected from the group consisting of [any of] zinc chloride, potassium acetate, phosphoric acid [or] and lithium chloride.

Please replace claims 14 and 15 with the following amended claims.

14(Amended). A method according to claim [11] 13 which container additionally includes an outlet to allow passage of said gas therethrough.

15(Twice Amended). A method according to claim 9 wherein the light emitted by said hygroscopic scintillator is measured remotely by [said] measuring means spatially separated from said hygroscopic scintillator, but optically connected thereto.

Please replace claims 17 and 18 with the following amended claims 17 and 18.

17(Twice Amended). A method according to claim 15 [claim 9] wherein said measuring means comprises one or more photomultiplier tubes, multichannel plates or photodiodes.

18(Amended). A method according to claim 17 wherein the rate of signal pulses from said measuring means is measured and used to indicate the tritium radiotoxicity of said gas, and/or its tritiated water activity, on a meter, a digital display as an audible signal, and/or as an output to a computer, data logger, recorder, or control system [or the like].

Please replace claim 33 with the following amended claim.

33(Twice Amended). Apparatus according to claim 31 wherein the time averaged output of said measuring means is measured as a continuous current, and used to indicate the tritium radiotoxicity of said gas on a meter, a digital display as an audio signal, and/or as an output to a computer, data logger, recorder, control system [or the like].